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Landsat 7 Calibration Parameter File Release

Version Description Document

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Executive Summary

The Version Description Document (VDD) is required by the Landsat Program Configuration Control Board for all software releases put into the operational environment. This VDD is the primary configuration control document used to track and control versions of Calibration Parameter files released to the operational environment. It is a summary of the features and contents of the CPF changes, and identifies and describes the version of the CPFs being delivered.

Keywords: Version Description Document (VDD), Calibration Parameter File (CPF).

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Section 1 Preface

This Calibration Parameter File (CPF) Change Description Document is controlled by the Mission Management Office System Engineering (MMOSE) and the Landsat 7 Data Handling Facility (DHF) Change Control Board (L7 DCCB) and accompanies the release of CPFs for the 4th Quarter of 2003.

Comments and questions regarding this document should be directed to:

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Section 2 Overview

This document details the Calibration Parameter Files (CPFs) released for the quarter beginning 01 October 2003 and the changes made to them.

Section 3 Reason for CPF Issuance and Changes

This release is a routine quarterly release for the 4th quarter of 2003. To address changes related to the scan line corrector failure on Landsat 7, which occurred on May 31, 2003, this release contains four CPFs: Two partial-quarter CPFs covering the periods April 1, 2003 to May 31, 2003 and June 1, 2003 to June 30, 2003, and two full-quarter CPFs covering 3Q2003 and 4Q2003. The partial-quarter CPF effective June 1, 2003, along with the 3Q2003 and 4Q2003 CPFs contain updates to existing parameters as well as one new parameter to improve the geometric quality of Level 1G products. In addition, the standard changes to the CPF attributes and the UT1 Parameters have been made to all CPFs.

Section 4 List of CPFs in Effect

The following table shows the CPFs in effect for each time period since the Launch of Landsat 7, as well as the preceding CPFs.

Period Covered	3Q2003 CPF Name	4Q2003 CPF Name
1 October 2003 – 31 December 2003	N/A	L7CPF20031001_20031231.01
1 July – 30 September 2003	L7CPF20030701_20030930.01	L7CPF20030701_20030930.02
1 June 2003 – 30 June 2003	N/A	L7CPF20030601_20030630.03
1 April 2003 – 31 May 2003	N/A	L7CPF20030401_20030531.03
1 January 2003 – 31 March 2003	L7CPF20030101_20030331.02	L7CPF20030101_20030331.03
1 October – 31 December 2002	L7CPF20021001_20021231.03	L7CPF20021001_20021231.04
1 July – 30 September 2002	L7CPF20020701_20020930.03	L7CPF20020701_20020930.04
1 April – 30 June 2002	L7CPF20020401_20020630.03	L7CPF20020401_20020630.04
1 January – 31 March 2002	L7CPF20020101_20020331.04	L7CPF20020101_20020331.05
1 October – 31 December 2001	L7CPF20011001_20011231.05	L7CPF20011001_20011231.06
01 July 2001 – 30 September 2001	L7CPF20010701_20010930.05	L7CPF20010701_20010930.06
01 April 2001 – 30 June 2001	L7CPF20010401_20010630.06	L7CPF20010401_20010630.07
01 January 2001 – 31 March 2001	L7CPF20010101_20010331.07	L7CPF20010101_20010331.08
01 October – 31 December 2000	L7CPF20001001_20001231.08	L7CPF20001001_20001231.09
19 July – 30 September 2000	L7CPF20000719_20000930.10	L7CPF20000719_20000930.11
01 July – 18 July 2000	L7CPF20000701_20000718.09	L7CPF20000701_20000718.10
01 April – 30 June 2000	L7CPF20000401_20000630.09	L7CPF20000401_20000630.10
01 January – 31 March 2000	L7CPF20000101_20000331.11	L7CPF20000101_20000331.12
09 December – 31 December 1999	L7CPF19991209_19991231.12	L7CPF19991209_19991231.13

24 November – 08 December 1999	L7CPF19991124_19991208.12	L7CPF19991124_19991208.13
01 October – 23 November 1999	L7CPF19991001_19991123.12	L7CPF19991001_19991123.13
01 July – 30 September 1999	L7CPF19990701_19990930.15	L7CPF19990701_19990930.16
01 April – 30 June 1999	L7CPF19990401_19990630.18	L7CPF19990401_19990630.19

Section 5 List of Changed Units

5.1 New Groups or Fields to CPF File Structures

A new parameter called "Unpowered_Pointing_Bias" was added to the SCAN_LINE_CORRECTOR group. This parameter represents the best estimate of the pointing angle of the SLC in its unpowered, "at-rest" pointing position. Landsat 7 was commanded to remove power to the SLC on June 6, 2003. Current plans call for the SLC to remain unpowered for the foreseeable future.

5.2 Deleted Groups or Fields in the CPF File Structures

There were no deletions to the CPF file structure with any of the CPFs released this quarter.

5.3 Modifications to Existing CPF Values

The following changes were made to those CPFs newly generated or modified this quarter:

5.3.1 File: L7CPF20031001_20031231.01

This is the new CPF for the 4th Quarter of 2003. The contents are based on the CPF file from 3Q2003 (File: L7CPF20030701_20030930.01) with the following changes:

5.3.1.1 GROUP=FILE_ATTRIBUTES

Routine changes to show new filename and effectivity dates.

5.3.1.2 GROUP= ANGLES_SME1_SAM

Coefficients to model the non-linear motion of the scan mirror have been refined based upon analysis from the IAS. All parameters within this group are affected. See Section 6, "Operational Changes to be Expected with New CPFs", for details.

5.3.1.3 GROUP= SCAN_LINE_CORRECTOR

PRIMARY_ANGULAR_VELOCITY and SECONDARY_ANGULAR_VELOCITY parameters have been set to zero reflecting the failure and subsequent removal of power to the SLC. A new parameter called UNPOWERED_POINTING_BIAS was added to describe the pointing angle of the SLC in its unpowered state. See Section 6, "Operational Changes to be Expected with New CPFs", for details.

5.3.1.4 GROUP= ACCA_THRESHOLDS

Automatic cloud cover assessment parameters have been refined based upon analysis from the IAS.

THRESH_B42_RATIO is the affected parameter. See Section 6, "Operational Changes to be Expected with New CPFs", for details.

5.3.1.5 GROUP=UT1_TIME_PARAMETERS

UT1 parameters have been updated based on estimated values as computed at the Naval Observatory.

5.3.2 File: L7CPF20030701_20030930.02

Changes made to the .01 version of this CPF include the FILE_ATTRIBUTES, ANGLES_SME1_SAM, SCAN_LINE_CORRECTOR, and UT1_TIME_PARAMETERS groups, as previously described.

5.3.3 File: L7CPF20030601_20030630.03

Changes made to the .02 version of this CPF include the FILE_ATTRIBUTES, ANGLES_SME1_SAM, SCAN_LINE_CORRECTOR, and UT1_TIME_PARAMETERS groups, as previously described.

5.3.4 File: L7CPF20030401_20030531.03

Changes made to the .02 version of this CPF include the FILE_ATTRIBUTES and UT1_TIME_PARAMETERS groups, as previously described.

Section 6 Operational Changes to be Expected with New CPFs

On May 31, 2003, the scan line corrector mechanism (SLC) aboard Landsat 7 failed. The function of the SLC was to compensate for the forward motion of the spacecraft using a set of rotating parallel mirrors to shift the ETM+ sensor line of sight from forward-to-aft as the primary mirror scanned from side-to-side. This compensation resulted in a ground imaging pattern having near-parallel, adjacent scans with little or no overlap and gaps. Losing the forward motion compensation provided by the SLC has resulted in a “zig-zag” ground imaging pattern, with significant amounts of overlapping imagery and scan gaps. Overlap and gaps are negligible down the center of a scene, but increase to nearly one scan width at the edges.

The SLC failure and the subsequent removal of power to the SLC on June 6, 2003, requires alterations to the ETM+ geometric model to reflect the halted state of the SLC and its new “at rest” pointing position. The non-moving state of the SLC has been indicated by setting the PRIMARY_ANGULAR_VELOCITY and SECONDARY_ANGULAR_VELOCITY parameters in the SCAN_LINE_CORRECTOR group to zero. The at-rest pointing angle of the SLC is described by the new UNPOWERED_POINTING_BIAS parameter. Also, prior to the SLC failure, it was believed that the working SLC contributed to the non-linear motion of the primary scan mirror. This effect has been removed by performing scan mirror calibrations using the IAS and updating the Legendre polynomial coefficients used to model the non-linear motion of the scan mirror. These coefficients belong to the ANGLES_SME1_SAM parameter group. Lastly, for the 4th quarter 2003 CPF, the ACCA_THRESHOLD parameter THRESH_B42_RATIO has been updated to improve automatic cloud cover assessment affecting bands 2 and 4.

Those wishing more information on processing changes that may be necessary as a result of the scan line corrector failure on Landsat 7 should consult the *Enhanced Thematic Mapper Plus Scan Line Corrector Geometric Processing Algorithm Theoretical Basis v. 1.1* available from the USGS EROS Data Center (<http://edc.usgs.gov/>).